DCH42 — PHYSICAL CHEMISTRY – IV

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define internal conversion.

2. Write Stern-Volmer equation.

3. How to represent quantum efficiency?

4. What is the difference between photovoltaic and photogalvanic cells?

5. Write the normalised wave function for a particle in a three-dimensional box.

6. Give Schrodinger wave equation.

7. What do you mean by hybrid orbital?

8. Find the π – bond order of ethylene molecule.

9. List out the assumptions of Einstein theory of heat capacities.

10. What is flux relation?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Describe the photophysical kinetics of unimolecular process.

Or

(b) Derive the expression for the deviation from Stern-Volmer equation due to dynamic quenching.

12. (a) Write a note on photoredox reactions with example.

Or

(b) Discuss the kinetics of hydrogen-chlorine reaction with rate law.

3. (a) Solve the Schrödinger wave equation for particle in one dimensional box.

Or

(b) Write the Schrodinger wave equation for hydrogen atom.

14. (a) Explain Born-Oppenheimer approximation.

Or

(b) How is valence bond theory used for the formation of hydrogen molecule?

15. (a) Derive an expression for internal energy in terms of partition function.

Or

(b) Derive Sackur-Tetrode equation.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Describe Jablonski's diagram for depicting various photo physical processes.

17. (a) Discuss the Solar energy conversion and storage. (5)

(b) Discuss the photoisomerization reaction of coordination complexes. (5)

18. Explain quantum mechanical treatment for a particle in three dimensional box.

19. How is Huckel molecular orbital theory applied for butadiene and benzene molecule? Explain.

20. Derive and discuss the Einstein and Debye theory of heat capacities of solids.

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